Sustainable Fashion and Textiles through Participatory Design:
A case study of modular textile design

Eunsuk Hur[*]

School of Design University of Leeds

e.s.hur@leeds.ac.uk

1. Introduction

Sustainability in fashion and textile design is growing in importance due to environmental and social issues related to both production and consumption processes in the fashion industry. In 2013, the Danish Fashion Institute (DAFI) reported that fashion is the world's second most polluting industry (cited in Ditty, 2015)[1] where significant environmental footprints and social issues occur at every stage of the product lifecycle (Defra, 2008)[2].

There are direct and indirect environmental and social impacts associated with the production, use, reuse, resilience and sustainable action surrounding the system of fashion production and consumption (Defra, 2008)[3]. Although these impacts arise at every stage of the product life cycle, from material exaction to the final sale of the product, it has been argued that the most significant environmental impacts of clothes are commonly associated with consumer use and the after-purchase phase (Fletcher, 2008)[4].

The popular phenomenon of 'fast fashion' trends encourages people to engage in excessive levels of consumption. According to Black (2008)[5], clothing sales have increased by 60 percent over the last ten years, and clothing is now far cheaper than it was a few decades ago. The fashion cycle today is also much shorter than it was in the last decade. She claimed that consumers now discard clothing after wearing it only a few times, whether the materials are recycled or virgin (Ibid.p.14)[6]. It seems logical to argue that the fast fashion trend encourages even greater levels of consumption and, eventually, waste production.

The traditional design approach would find it difficult to tackle the sustainable design goal. Typical design approaches commonly emphasize designing the visual element of new products, highlighting the importance of aesthetics, artistic experimentation, and commercial values in design, while little consideration is given to the integration of sustainability. Indeed, sustainability is not considered as an essential part in design processes or is often regarded as self-examination (Heeley, 1999)[7]. Furthermore, the current fashion system has encountered increased criticism with regard to the fractured relationship between the fashion and consumer value chain. Consumers have little knowledge about how and where products are made (Ditty, 2015)[8] or the impacts of related consequences of both production and consumption processes in fashion. We are now faced with the fact that these approaches are not sufficient to encourage sustainable fashion and that a new approach is needed.

This research explores the way in which participatory design processes might contribute to sustainable fashion and textiles through utilization of a modularity and disassembly system of design. The researcher reviews the meaning of sustainability in fashion and textiles, and discusses the challenges to incorporating sustainability in fashion design. This paper also reviews the concept of participatory design and how this concept could be utilized to overcome the challenges of addressing sustainability in fashion and textile design.

This research proposes an alternative way to tackle sustainability issues in fashion and textiles through the exploration of a modular textile design that encourages consumer participation in the design process. Instead of throwing away clothing and replacing it with something new, consumers of modular clothing design systems will be able to transform their purchases, allowing their clothing to adapt to numerous fashion styles through the assembly and disassembly of each modular textile—a revolutionary approach that could potentially minimize excessive consumption.

Modular design also seeks to develop a co-design approach to fashion that will allow users to participate in the design process by giving them freedom of design through playful experiences and diverse applications of modular designs in the apparel field. More specifically, this modular tool aims to address the issue of rapidly changing consumer needs and wants, as well as to reduce clothing consumption levels by increasing clothing's emotional durability.

* 책임저자(Corresponding Author)

허은숙: Dr. Eunsuk Hur

e.s.hur@leeds.ac.uk

2. Literature Review

2.1 Defining Sustainable Fashion Design

The term 'sustainable fashion design' has not yet been fully defined in literature. One of the main reasons is that both terminologies are complex components within broad discussion and have different interpretations. Furthermore, the relationship between the concepts of fashion and sustainability seems to contradict each other. The meaning of fashion commonly implies "a way of behaving or doing something that is accepted and used by the majority of a group of people at a given point in time, regardless of the size of the group" (cited in Yurchisim and Johnson, 2010, p1)[9]. Fashion is inherently the most change-intense category of consumer products (cited in Gam and Banning, 2011)[10]. The nature of fashion, then, is based fundamentally on a continuous process of change, involving multiple facets in different ways at different times, which may be defined as a succession of short-term trends or fads (Easey, 1995)[11]. It inevitably remains for only a limited period of time before being replaced by a new fashion.

On the other hand, the term 'sustainable' implies longevity and is derived from the function of ecosystems that assist themselves over periods of time (Thorpe, 2007, p7)[12]. Sustainability can be defined in many ways: balanced use of natural, social, economic and environmental factors for the continual health of the earth and future generations (WCED, 1988)[13]. This broader definition of sustainable design focuses on how design can positively influence environmental and social issues, as well as considering economic benefits for industry, by looking at the interconnection of relationships and the overall context as a reflection of current patterns of consumption and production.

Kate Fletcher (2008)[14], in her book 'Sustainable Fashion and Textile Design Journeys', provides a useful insight to rethink the role of fashion and cultivate new aspirations for sustainability. According to her interpretation, fashion and clothing are different concepts connected in different ways. Clothing is a material production while fashion is a symbolic production. Fashion is connecting with humankind and is in the heart of our culture dealing with our emotional needs, dealing with social beings as individuals and manifesting through garments. It is not just material consumption of clothing (Ibid, 2008, p120)[15]. Clothing is concerned primarily with the physical and functional needs of shielding people from their environments. Fletcher (2008) argued that the fashion sector and the clothing industry come together in the form of fashionable clothes, such that emotional needs manifest as physical goods. These emotional needs are often satisfied through material consumption, which generates waste and promotes excessive consumption levels.

Indeed, fashion reflects not only the functional aspect of clothing, but also the symbolic medium that directly links individuals with their social needs through daily lifestyles. Therefore, fashion plays a significant role in transforming the core of our culture by addressing sustainability in the various production and consumption processes of clothing design.

While, Chapman and Gant (2007)[16] criticize the dominant notion of current sustainable design. They argued that sustainable design is predominantly rooted in the reduction of environmental and social impacts and that the conclusion of sustainable design is not to consume, not to have and to lead a minimalistic life. The suggestion of considering sustainable design should be more focused on steering people towards alternative approaches for production and consumption, incorporating new thinking and design innovation (Ibid, 2007, p6)[17].

Consequently, sustainability in fashion design calls for fundamental changes and thinking in relation to the design process and a consideration of how design affects production and consumption. Fashion and textile designers should rethink the processes of design and incorporate sustainability into the way in which they design the dimensions of products and also shape the culture of design practices.

2.2 Social Innovation and Participatory Design

Participatory design has its roots in the labour movements in Scandinavia in the 1950s; the terminology has diversified since then to embrace 'participatory design' 'collaborative design' 'co-design' 'social design', and 'transformation design' (Fuad-Luke, 2009)[18]. This is based on participatory practices in combination with a user-centered method, building on traditional design skills to address social and economic issues (Sanders and Stappers, 2008)[19]. This involves participatory activity and consumption, consumer engagement is defined as "a person's perceived relevance of the object based on their inherent needs, value and interests" (Zaichkowsky, 1985)[20].

Sanders (2002)[21] observed a paradigm shift from designing for users (i.e., a user-centred design process) to designing and creating together with users by providing various levels of participatory experiences. Such a participatory design approach gives designers the opportunity to involve their users, potentially building deeper understandings of the design process through the users' ability to create their own styles and to experience alternative concepts and approaches (Hur and Thomas, 2011)[22]. Csikszentimihalyi (1996)[23] suggests that active engagement enables people to achieve human wellbeing. He explored the "flow", the active engagement (whether in creative arts or physical activity or competition) which turns our consciousness and uniquely establishes human motivation. He emphasized that "Happiness comes from creating new things and making discoveries. Enhancing one's creativity may therefore also enhance well-being." He notes that connecting between this flow and happiness depends on whether the flow-producing activity is complex, whether it leads to new challenges and hence to personal and cultural growth (Ibid, 1996). It is a very convincing argument that when people actively participate in the design process, people can develop a deeper understanding of the process which enables them to realize the degree of effort necessary to produce one product. It could be argued, then, that people can gain more satisfaction from a product through being involved during the design process and in turn create products with more value and meaning to user. Therefore, this active participation and engagement may encourage retention and continuous engagement with products. This could be as a result of a long

communication in design process and also give people a sense of more emotional wellbeing.

Similarly, Escobar-Tello and Bhamra (2009)[24] also emphasized the role of active engagement in the context of happiness for sustainable design. "The engagement level establishes stronger or weaker relationships with products as it influences the perception of our experiences, defining our level of satisfaction. If we are left satisfied we are more likely to keep the product, re-use it, repair it and value it? in other words be 'happy' with it… it is urgent that the societal context we re-design through our products enables sustainable changes to take place without having to leave behind social networks which feed our well-being" (Ibid, 2009). Co-design creates through social interaction; while essentially created by the users, the experience would not be the same or even impossible for experience that it provides. What people do and create together is much more interesting and unpredictable than what people do when they use things alone. Creativity, then, is not just the domain of the designers (Battarbee, 2004 p121)[25].

Thanks to the DIY (Do It Yourself) movement, second hand goods are increasingly popular with the younger generation, Oxfam International (2015)[26] encourages the consumer to create their own styles. The UK Design Council (2010)[27] also emphasized the context of social networks as "co-creation" in public services. Otto von Bush describes the new vision of a designer as a "street level collaborative practical facilitator and creative teaser" (Fletcher, 2008, p192)[28]. Thorpe (2010)[29] notes the designer's role as "involving with user acting as a catalyst for user research, facilitation, visualizing structures and systems for product development, and inventing a shared language for problem solving"(Thorpe, 2010)[30]. Applying these principles to fashion and textile design means that designers need to rethink about how to engage with people and how to create a sustainable future together so that anyone involved in any dimension of fashion development can share knowledge and understanding and inspire each other to empower their own voice in design.

This is the one potential tool for promoting sustainable consumption through different person's relationship with user and flourishing human wellbeing. Hand craft's DIY movement can be one of meaningful social change and community level of localized product or service can slow down fast fashion. However, it is also still early in the development stage; pragmatically, designers cannot force everyone to buy sewing machines or attend sewing classes to engage in the design process. More importantly, when we look at the co-design practices in fashion industry, they are mostly focused on customization product rather than embracing environmental impact. Product system and consumption activities are interconnected influencing the way consumption occurs. Therefore, in order to encourage sustainable fashion consumption and cultivate human wellbeing, it is important to embrace reducing the environmental impact of clothing as well as exploring value and meaning in design process. Of course, it would be challenging to embrace all different components in one system. However, if we consider design more systemically and the bigger picture into one system, sustainable design could flourish in the fashion industry.

3. Research Method

3.1 Modular Textile Design and Prototypes

In a previous study, Hur (2009)[31] explored the role of active user engagement in the design process through modular design. Initial modular textile prototypes were created through the adaptation of geometric patterns, with consideration for different color ranges and material properties. A variety of materials were tested to identify the most suitable modular textile system to facilitate potential user participation in the design process. The toolkit shown in Figure 1 was developed as part of the MA Textile Futures program at Central St Martins (CSM), University of the Arts London (UAL), and it provides a visual illustration of how such kits may be developed to easily teach consumers to make products themselves.

A further investigation carried out by Hur and Thomas (2011)[32] explored the principles of design modularity through the adoption of the principle of symmetry, the use of tessellations and the adaption of various geometric shapes. The intention behind creating the modular toolkit is for the product to stand the test of time; however, the kit also gives users the opportunity to unleash their inner creativity to develop new and interesting items, whether they be clothing or home accessories. This modular system of textiles can be united or taken apart according to the will of the user, thus creating a flexible approach to user-based design.

The first step of interaction with the user is through 'tool kit instruction' involving instructions prepared by the design researcher. Although consumers are able to make without instruction, the provision of a toolkit avoids consumer confusion during the learning and making process, thereby facilitating engagement in the design process. Consumers may have fear of creation as it challenges the norms of their experiences; an easy way of visualized instruction would be an essential first stage in system change.
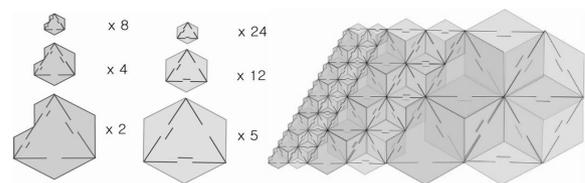

Fig 1: Modular textile design toolkit

Fig 2: Modular fashion and homeware

As part of the research, several workshops and exhibitions were initiated during 2009 and 2010. First, a co-design pilot workshop involving a focus group discussion was completed. For this research, we recruited five participants in London whose ages ranged from 20 to 35 years. The participants made their own designs, given the freedom to decide the material, size, quantity, color, fashion style and product type. After producing their own unique works, the participants shared their ideas and modular pieces, often incorporating playful experiences.

After the pilot test, various exhibitions were held at Salone Satellite during Milan Design Week 2009, at Tent London during the London Design Festival 2009, at Warp Factor 09', at Tokyo Design Centre in Japan in 2009 and at the Trafalgar Hilton Hotel in London in 2010. Figures 3 and 4 show examples of exhibitions and gallery visitors. Furthermore, a large-scale workshop to facilitate an exploration of the co-design practice took place at a central London 'pop-up' shop over a five-day period in March 2010. This workshop event was a collaboration with other designers, and it sought to cultivate a new dialogue in design through participatory activity

Fig 3: Example of exhibition and gallery visitors

Fig 4: Example of Exhibition: The Trafalgar Hilton Hotel

4. Findings and Discussion

Through a pilot study, various exhibitions and a workshop, this research evaluated users' acceptance of modular design. The modular textile toolkit enabled users to select different modular shapes, colours and functions. The research indicated that participants were comfortable wearing scarves and hair accessories that they had designed and that they found it easy to construct their garments.

The participants also wanted to use and keep their modular textile designs and showed intentions of purchasing fewer products due to their ability to personalize the modular clothing's flexible design and the ease with which they could make products with multifunctional purposes. The modular design approach facilitates the re-fashioning of products with second lives through the removal of damaged sections or the addition of more modules over time.

Depending on participants' levels of design experiences, their desired design complexity and the sections of modular textile shapes, the production process using the toolkit is very quick. It was noted through observation that people already engaged in creative activity or had a strong interest in art and

design were more likely to participate, which correlates to the assumption that participation is more likely when it is within the norms of the participants experience. However, the workshop attendees could be divided roughly into two types; those actively participating and those observing at distance. This indicates that, although the process encourages interest, there is a barrier to be overcome when encouraging co-design. Further research is necessary to explore group dynamics and identify early adopters in a co-design model. Although this workshop was used as a pilot, its primary role was to encourage people to participate in the design process in the context of social integration rather than collecting the exact quantitative data. As part of this research project, workshop methods will be further refined and used as exploratory tools in co-design. Figure 5 illustrates workshop participants as they engage in the design process.

Fig 5: Example of workshop participants and Users generated designs

Each set of textile pieces can be rearranged to transform one item into various other hybrid designs. This community level co-design can extend collaborative design practices which enable groups of people to share their experiences and knowledge more actively in a social context. This example can be not only a 'learning by doing' process enhancing the user's inner creativity, but also a flexible approach to transform various products. It has been observed that individuals who are comfortable with creative processes are active participants in co-design. The research findings suggest that a participatory design process will allow the industry to address the potential of sustainability and to rethink how we produce and consume products. It will also facilitate user creativity and design innovation through the engagement of numerous users beyond existing boundaries, thus reinventing current approaches to design.

Although this study highlights several advantages to the use of modular design systems and reveals several insights into the incorporation of user participation in the design process, potential limitations must be acknowledged. First, it is important to test the durability, fit and mobility of each modular shape, as well as to analyse product longevity in order to investigate how consumers use modular textile products and how they last over long periods of time. Product longevity is directly related to sustainability—and, thus, requires further investigation. For example, different fastener options could be considered to increase the durability of the clothing, while design modularity could be facilitated through the use of various creative design solutions.

The feedback from the workshop indicates that participants preferred to engage with a limited palette; they tended to feel overwhelmed given too many options. From this it may be derived that the best option would be to provide a designer 'choice board' for the user. In the early stages of implementing co-design, this gives the opportunity for users to engage in 'customization' by following the designer's 'ready-made product' or visualized catalogues. During this process, the pilot workshop has shown that more confident participants produce distinctive designs. The workshops also indicated that people preferred bigger shapes when 'building' clothing. A common complaint was that smaller shapes were time consuming.

Emotional properties are mainly psychological feeling related product use and design process. A common response to the design process was reminiscence about childhood activities. Similar to participatory toys like Lego, this design process encouraged making through play. However, emotional properties are also interrelated with functional properties and the comfort of the clothing (in a physiological and psychological sense).Therefore, further research will be conducted with user surveys in order to exact data and feedback from the user.

Second, the research could be extended through interactions with users in online communities. Collective groups of users can share knowledge relating to different methods of upcycling clothing in order to facilitate and build alternative solutions for sustainable fashion design. It is important to investigate the characteristics of different co-design approaches and tools for participants, as well as to identify users' intentions and motivations in taking part in the design process.

User feedback was gathered qualitatively; this proved difficult to objectively analyses. The next stage of this project is to develop a more rigorous approach to workshop analysis and observation, including the development of tools for documenting user engagement. Key characteristics of successful systems will be identified and adopted. This will feed into the workshop events which will be organized as part of this study. As discussed, some weaknesses were identified in the procedure for the pilot study. Therefore, future research will be conducted with both quantitative and qualitative feedback methods. This feedback will form part of a 'feedback loop' which will both influence the practical design toolkits and the way in which the community events are organized.

Participatory design in fashion and textiles is still in its early development stage, and there are a number of ways to identify and explore the potential opportunities and barriers in this field. It is essential to investigate and suggest different approaches for engaging with other stakeholders, including manufacturers, retailers and designers, in order to encourage sustainable design actions.

5.   Conclusion and Implications

The aim of this research was to encourage the public to stop being passive in their consumption and to become a part of the design process, as well as to give consumers greater ownership over their fashion products. The research also sought to give people a greater sense of the emotional durability that embodies emphatic experiences in product consumption. To accomplish these objectives, this research proposed a transformative modular toolkit to promote sustainable fashion. The findings indicate that users found it easy to design their own products and that they experienced increased interest in the design production process.

Changing ordinary materials from the ordinary into the extraordinary through communication with users in the aim of giving people a sense of greater durability and emotional, in order to allow for a greater range of possibilities, which results in a multidisciplinary design hybrid. This can be promote and inspire a closer and a more sustainable vision. The modular textile system described within this paper was based on simple geometric shapes. However, this modular system allows these shapes to be transformed into sophisticated textile designs for fashion or interior decoration.

Workshop participants considered the modular design toolkit as easy to understand and use but an improvement was also made in order to optimize co-design toolkit performance. Unlike traditional textile designs there is no sewing as the textile and the garment are created simultaneously and this module system enables the creation of products with a second "life" through the system's capacity for reinvention.

A co-design approach places the opportunity of engagement with the user, potentially creating more sustainable consumption linked with the production process. This approach involves communication with the user, combining reflection about the product and social inclusion in the design process.

References

1 Ditty, S. (2015.01.09). Europe in the world: The garment, textiles & fashion industry Online. Retrieved 2015. November 5, from https://europa.eu/eyd2015/en/fashion-revolution/posts/europe-world-garment-textiles-and-fashion-industry

2 Defra (2008). Sustainable clothing action plan. London: Department for environment, food and rural affairs.

3 Ibid.

4 Fletcher, K. (2008). Sustainable fashion and textiles: design journey. London: Earthscan.

5 Black, S. (2008). Eco-Chic: The Fashion Paradox. London: Black Dog Publishing Limited.

6 Ibid.

7 Heeley, J. (1999). Environmentally conscious textile design: Towards a new approach. Edited EcoTextile '98-sustainable development, Cambridge: Woodhead Publishing.

8 Ditty, S. (2015.01.09). Europe in the world: The garment, textiles & fashion industry Online. Retrieved 2015. November 5, from https://europa.eu/eyd2015/en/fashion-revolution/posts/europe-world-garment-textiles-and-fashion-industry

9 Yurchisin, J., and Johnson, K. K. P. (2010). Fashion and the consumer. UK: Berg, Oxford International Publishers.

10 Gam, H. J. and Banning, J. (2011). Addressing sustainable apparel design challenges with Problem-Based Learning, Clothing and Textiles Research Journal, vol. 29, no. 3, pp.202–215.

11 Easey, M. (2009). Fashion marketing. Oxford: Wiley-Blackwell.

12 Thorpe, A. (2007). The Designer's Atlas of Sustainability. Washington, D.C.: Island Press.

13 WCED (1988). Our Common Future, Report of the World Commission on Environment and Development. Oxford: Oxford University Press.

14 Fletcher, K. (2008). Sustainable fashion and textiles: design journey. London: Earthscan.

15 Ibid.

16 Chapman, J. and Grant, N. (2007). Designers, Visionaries & Other Stories: A collection of sustainable design essays. London, Earthscan.

17 Ibid.

18 Fuad-Luke, A. (2007). Redefining the purpose of (sustainable) design: Enter the design enablers, catalysts in co-design, in J Chapman and N Gand (ends), Designers, Visionaries and Other Stories. London: Earthscan.

19 Sanders, E.B.-N. and Stappers, P.J. (2008). Co-creation and the new landscapes of design. CoDesign, 4(1), pp. 5-18.

20 Zaichkowsky, J. L. (1985). Measuring the Involvement Construct. Journal of Consumer Research, 12 (3), pp. 341-352.

21 Sanders, E.B.-N. (2002). From User-Centred to Participatory Design Approaches. Design and the Social Sciences, J. Frascara (Ed.), New. York: Taylor & Francis Books Limited.

22 Hur, E. S. and Thomas, B.G. (2011). Transformative Modular Textile Design. Bridges Coimbra: Mathematical Connections in Art, Music and Science Tarquin Publications.: pp..217-224.

23 Csikszentmihalyi, M. (1996). Creativity: Flow and the psychology of Discovery and invention. New York: HarperCollins Publishers, Inc.

24 Escobar-Tello, C. and Bhamra, T. (2009). Happiness and its role in sustainable design, 8th European Academy of Design Conference, Aberdeen: The Robert Gordon University.

25 Battarbee, K. (2004). CO-Experience, Understanding user experiences in social interaction, Helsinki, Publication series of the University of Art and Design Helsinki.

26 Oxfam International (2015) DIY Clothing Online. Retrieved 2015. November 30. http://www.oxfam.org.uk/search-results?q=DIY;show_all=ogb_mixed

27 The UK Design Council (2010) Co-Design, Dott Cornwall project Retrieved 2010. Online. Retrieved 2015. November 30. http://webarchive.nationalarchives.gov.uk/201004070222 14/designcouncil.org.uk/design-council/1/what-we-do/our-activities/dott-cornwall/

28 Fletcher, K. (2008). Sustainable fashion and textiles: design journey. London: Earthscan.

29 Thorpe, A. (2007). The Designer's Atlas of Sustainability. Washington, D.C.: Island Press.

30 Ibid.

31 Hur, E. S. (2009). Nomadic Wonderland: Can transformative textiles support sustainable design in our new nomadic way of life?, MA thesis, MA Textile Futures, Central Saint Martins, University of the Arts London: London. |

32 Hur, E. S. and Thomas, B. G. (2011). Transformative Modular Textile Design. Bridges Coimbra: Mathematical Connections in Art, Music and Science Tarquin Publications.: pp..217-224.